

## **Macroinvertebrate Response to Land Use and Stream Chemistry in the Mid-Atlantic Coastal Plains**

Megan Mehaffey

Research Ecologist

U.S. EPA Office of Research and Development (ORD)/National Exposure Research Laboratory (NERL)/Environmental Sciences Division (ESD)/Landscape Ecology Branch (LEB)

(919) 541-4205

mehaffey.megan@epa.gov

**Authors:** Megan Mehaffey, Maliha Nash, Ann Pitchford

U.S. EPA ORD/NERL/ESD/LEB

**Keywords:** macroinvertebrate, Mid-Atlantic Coastal Plains, land use, first-order streams, reference sites

The Landscape Indicators for Pesticides Study in Mid-Atlantic Coastal Streams (LIPS-MACS) is a research collaboration between the U.S. Environmental Protection Agency's (U.S. EPA) Office of Research and Development and the U.S. Geological Survey's National Water Quality Assessment Program. Pesticides, nutrients, and other chemicals can dramatically affect water quality and biota in streams in areas with substantial agriculture, industry, or urban development. Thus, the landscape setting can provide crucial information about a water body's condition. We examined the applicability of landscape indicators to efficiently estimate the biological integrity of streams in the Mid-Atlantic Coastal Plains Region.

A base network of 174 small (typically first-order) streams was selected across a gradient of hydrogeologic and land-use settings, from a population of 10,144 first-order watersheds in the region. Of the 174 sites, we used a subset of 82 sites having benthic riffle samples for our analyses. We used principal components and cluster analyses to group the first-order stream watersheds by land use in order to capture the greatest variability across the region. The analyses resulted in clustering the watersheds into three distinct groups. The first group was dominated by natural cover (forest and wetland), the second by urban, and the third by cropping.

We used non-parametric analyses to test differences in benthos and water chemistry data between clusters. We found that typical water chemistry measures associated with urban runoff, such as specific conductance and dissolved chloride, were significantly higher in the urban group. In the highly cropped group, we found variables commonly associated with farming, such as nutrients and pesticides significantly greater than the other two groups. In addition to the higher pollutant loads, the urban and cropped watersheds also had lower numbers of intolerant and a higher numbers of tolerant macroinvertebrate species. Results suggest that land use-based clustering may provide a viable alternative to intensive survey as a first step for site selection or for targeting watersheds for monitoring and assessments at the regional or national scale.

Disclaimer Notice: This work has been funded by the United States Environmental Protection Agency. It has been subjected to Agency review and approved for publication.